California Plant Pest & Disease Report

California Department of Food and Agriculture
Plant Pest Diagnostics Center
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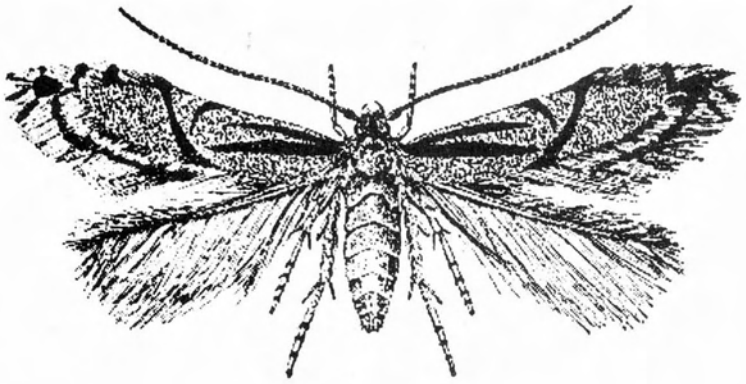
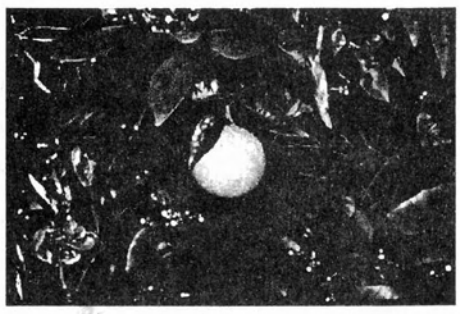


CITRUS LEAF MINER FOUND IN CALIFORNIA

What's Inside:
Volume 18 Nos. 5-6,
October-December, 1999



California Plant Pest & Disease Report

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The California Plant Pest and Disease Report, Volume 18, Numbers 5-6, was issued and printed April, 2000.

ENTOMOLOGY HIGHLIGHTS

SIGNIFICANT FINDS

AFRICANIZED HONEY BEE (AHB), *Apis* "Africanized" -(B)- Four swarms of AHB were reported between October and December, 1999. Three of these swarms were found by UC Davis researcher Dave Nielsen in Kern County. The bees were found 10 miles west of Lake Isabella along Highway 178, on Weed Patch Highway east of Bakersfield, and in the town of Lebec. The other swarm was found in Oxnard, **Ventura** County by Bob Flores and Freddi Herrmann from the Los Angeles County Agricultural Department. This was a new county record for Ventura. As a result of these finds, the AHB colonized area has been extended in both Kern and Ventura Counties. The new AHB colonized area in California is now 43,840 square miles and includes all of Imperial, Los Angeles, Orange, Riverside, San Bernardino, and San Diego Counties, and portions of Kern and Ventura Counties.

GUAVA FRUIT FLY, *Bactrocera correcta* -(A)- One guava fruit fly was found on November 1, 1999 in Monterey Park, Los Angeles County. The find was made by county trapper Ignacio Velazquez from a Jackson trap placed in a persimmon tree. No additional flies were found.

MELON FRUIT FLY, *Bactrocera cucurbitae* -(A)- Two melon fruit flies were found between October and December, 1999. On November 8, one male melon fly was found in El Monte by county trapper Rudy Sifuentes. An additional male melon fly was found on November 15 by county trapper Ignacio Velazquez in Rosemead. As a result of this find, an eradication project was implemented. No additional flies were detected.

MEXICAN FRUIT FLY, *Anastrepha ludens* -(A)- Two Mexican fruit flies were trapped between October and December, 1999. Both finds were in Fallbrook, San Diego County. CDFA Inspector Raina Ruiz and county trapper Ellie Vanarelli found the first fly on October 12 in a sapote tree. CDFA trapper Roberto Sanchez found the second fly on October 28 in a grapefruit tree. Both flies were found in McPhail traps. An eradication project started after the second fly was found. No additional flies were detected.

OLIVE FRUIT FLY, *Bactrocera oleae* -(A)- Forty-nine adult olive fruit flies and 5 pupae were found between October and December, 1999. Please see the chart on page 78 for additional trap information.

ORIENTAL FRUIT FLY, *Bactrocera dorsalis* -(A)- Four Oriental fruit flies were trapped between October and December, 1999. Please see the chart on page 78 for additional trap information. No additional flies were found.

PINK BOLLWORM, *Pectinophora gossypiella* -(A)- A total of 429 native (non-sterile) moths were collected during Fiscal Year 1999-2000 in the San Joaquin Valley. The total number of traps deployed during the peak of the season was 13,640. The following list indicates numbers by county:

Fresno County	Kern County	Kings County	Merced County	Tulare County	Madera County
17	264	57	16	72	3

NEW COUNTY RECORDS

AFRICANIZED HONEY BEE (AHB), *Apis* "Africanized" -(B)- AHB was found for the first time in **Ventura** County in October, 1999. The swarm was found at a landfill in Oxnard by Bob Flores and Freddi Herrmann of the Los Angeles County Agricultural Department.

OLIVE FRUIT FLY, *Bactrocera oleae* -(A)- Two olive fruit flies were found in **Riverside** County on November 3, 1999. The flies were found in a McPhail trap by county trapper Laura Doughty in Lake Elsinore.

COMSTOCK MEALYBUG, *Pseudococcus comstocki* -(B)- This mealybug was found in Lucerne, **Lake** County on September 7, 1999 by homeowner Betsy Spillane. It was previously found in Fresno, Kern, Kings, Stanislaus, and Tulare Counties.

This mealybug was first found in Porterville, Tulare County on August 23, 1967. It was subject to an eradication program for several years. Dr. Dale Meyerdirk, then of the USDA Boyden Research Laboratory at UC Riverside, released natural enemies that brought it under control. At that time it was becoming a serious pest on dooryard mulberry and on commercial citrus and pomegranate.

The following report on Comstock mealybug is adapted from the California Department of Food and Agriculture Detection Manual,1974, prepared by E. A. Kane and E. L. Paddock:

Adults: Adult females are considered to be typical appearing mealybugs, with a body length of 5mm exclusive of the prominent caudal filaments. The body is segmented, oval in shape with well-developed legs, and is covered with a waxy-mealy coating. Removal of this coating reveals the body as a light yellow or grey to brownish. The ephemeral males are rarely seen. They are minute, gnat-like, reddish-winged insects with long caudal filaments and may live up to two days.

Nymphs: The distinct salmon color typical of this mealybug is shown in the minute crawlers. First instar crawlers are similar to the scale insect crawlers. The later female instars develop the white, waxy coverings over the body. The older insects deepen in color to a light brown.

Egg Masses: Egg masses may approach dramatic proportions with large accumulations of mealy material and adult body parts. This material envelops the small, yellow colored eggs. Egg masses may be found on the bark, leaves, or in crevices of the host plants, or in the soil and on various objects in the surrounding area.

Pupa: Only male Comstock mealybugs pupate. The spun cocoons are silken, white, and cylindrical, approaching 3 mm in length. They are generally found in a protected mass.

Host Range: The Comstock mealybug is phytophagous. Apple, citrus, peach, pear, and pomegranate are among some of its favored agricultural hosts. Ornamentals include mulberry, catalpa, boxwood, *Fatsia*, privet and jasmine. It has been a particular problem of apple

production in Japan. Russian literature notes it as a pest of corn, sugar beets, potatoes and cotton. It has been responsible for the restricted movement of citrus and pomegranate from the infested counties into the southern coastal areas due to quarantine restrictions.

Economic Damage: Attacked plants suffer a lack of vitality and growth vigor due to extensive feeding damage. Death of the host plant may occur when heavy pest populations are feeding. Fruit quality and yield are compromised when the hosts are fed upon, and in some cases results in unmarketable fruit. Many ornamental plants become aesthetically and physiologically damaged due to unsightly accumulations of adults, egg masses, and honeydew.

References:

Hough, W.S., 1925. Biology and Control of Comstock's Mealybug on the Umbrella Catalpa, Virginia Ag. Exp. Sta., Tech. Bull. 29.

Kane, E.A., 1971. Comstock Mealybug Report, Calif. Dept. Agric.

McKenzie, H.L., 1967. Mealybugs of California, Univ. of Calif. Press, Berkeley.

Moreno, D.S., D.F. Reed and J.G. Shaw, 1972. Sex Lure Survey trap of Comstock Mealybug, Citrograph, Dec. 1972, pp 43 and 68.

Schoene, W.J. 1939. The Comstock Mealybug on Apple, Virginia Fruit, Jan. 1939.

Smith, J.D., 1972. Progress Report on the Comstock Mealybug, Calif. Dept. Agric.

Wilkey, R.F., and H.L. McKenzie, 1961. Systematic Status of the *Pseudococcus maritimus-malacearum* Complex of Mealybugs, The Bulletin of the Calif. Dept. of Agric., Vol. L, No. 4, pp 245-249.

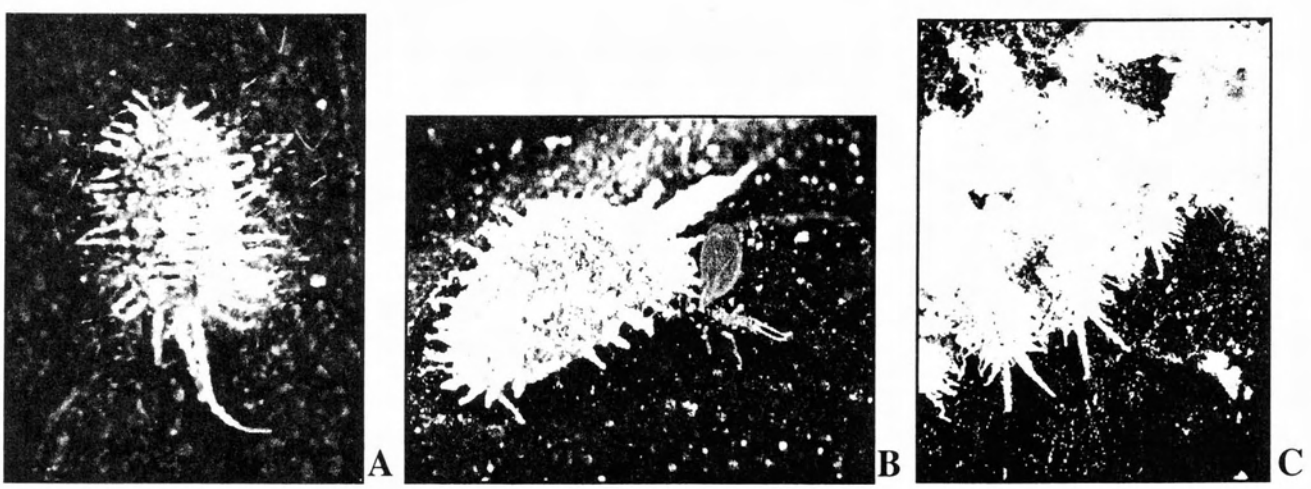

Fig 1 A. Adult female Comstock mealybug. B. Female (left) and male(right). C. Females with egg mass.

Oriental Fruit Fly, *Bactrocera dorsalis* complex, -(A)- October-December, 1999 collections

County	City	Date	#M/F/Stage	Trap	Host	Collector(s)
Santa Clara	San Jose	10/08	1M	Jackson	orange	Alvarez
Alameda	Fremont	10/15	1M	Jackson	apple	Simmons
Los Angeles	Sun Valley	10/19	1F	McPhail	olive	Snyder
San Diego	Carlsbad	11/05	1M	Jackson	guava	Wennerstrom

Olive Fruit Fly, *Bactrocera oleae*, -(A)- October-December, 1999 collections

County	City	Date	#M/F/Stage	Trap	Host	Collector(s)
San Diego	La Jolla	10/11	1F	McPhail	guava	Agnes
Santa Barbara	Santa Barbara	10/14	27M/13F	Champ	olive	Asakawa
Santa Barbara	Santa Barbara	10/14	2P	N/A	olive	Asakawa
Santa Barbara	Santa Barbara	10/14	3P	N/A	olive	Asakawa
Riverside	Lake Elsinore	11/03	1M/1F	McPhail	olive	Doughty
San Bernardino	Rialto	11/15	1M	McPhail	olive	Cruz/Ruiz
Ventura	Simi	12/16	1M	McPhail	orange	Calderwood
Ventura	Ojai	12/20	1F	McPhail	olive	Zegers
Ventura	Simi	12/20	1F	McPhail	orange	Calderwood
Ventura	East Simi	12/28	1F	McPhail	olive	Calderwood
Ventura	Simi	12/30	1F	McPhail	orange	Calderwood

NEW STATE RECORDS

CITRUS LEAF MINER, *Phyllocnistus citrella* -(Q)- This leaf-mining moth was recently discovered in the state for the first time in **Imperial** County. Infestations were found on January 12, 2000 in a nursery three miles east of Calexico and 1.5 miles north of the international border with Mexico. The following is a report by CDFA Area Manager Bill Routhier:

> Citrus leaf miner has been confirmed from a nursery three miles east of Calexico and 1.5 mile north of the international border with Mexico. The infestation within the nursery is general and involves citrus that has been in place for many months and stock that had recently been shipped from a wholesale nursery in Thermal, Riverside County.
>
> In response Imperial County personnel have inspected hosts outside the nursery and citrus leaf miner has been found at three residences, one residence is 1/4th mile west of the Calexico nursery and two residences are six to seven miles northeast near Holtville. Imperial County Department of Agriculture is continuing delimitation surveys in El Centro, Imperial, Heber, Calexico, and Holtville.
>
> Preliminary inspections at the source nursery in Thermal have been negative. Efforts are continuing to pinpoint the source of the infestation.

The following data is taken from the USDA publication "Insects not known to occur in the United States" 1958, Vol.#8; 35-36, and includes technical information about this new pest:

Citrus plants are sometimes seriously hampered by attacks of *Phyllocnistus citrella* in citrus growing areas of Asia, especially the young tender shoots and leaves of plantation plants and young nursery stock. Injury is caused by larval mining which results in the killing of large amounts of tissue. When the mines become excessive in number, growth of the plant stops, though an infestation seldom causes the death of the tree. The mines have been reported as points of citrus canker infection in some areas where the disease occurs.

The miner occurs throughout tropical Asia; being recorded from Iran, India, Sri Lanka, East and West Pakistan, Burma, Thailand, Malaya, Indonesia, Indochina, China, Korea, Japan, Formosa, Netherlands, New Guinea, Philippines, Loochoo Islands, Mariana Islands, and the Carolina Islands.

The eggs are laid singly, two or three per leaf, on either surface, but usually on the underside near the midrib. During the summer, hatching takes place in about three days. The young larvae enter the leaf tissue and feed as miners without coming to the leaf surface during their five to six day development period. Typical injury consists of irregularly twisted galleries containing a brownish excrement. The epidermis over the galleries appears as a silvery film. Most of the mines are found on the upper surfaces of the leaves in the more

humid and tropical areas. When larval feeding ceases, the epidermis of the leaf and opposing tissues are forced apart by the rolling and arching action of the larvae, thus forming a pupal chamber. That portion of the cocoon that is visible has a distinct orange cast. Emergence takes place in about six days, usually during the early morning hours. The adults are nocturnal and seldom seen. Populations are lowest from December to February and greatest from March to May and September to November in the Punjab of India. The species passes the winter solely as an adult. Approximately six generations are produced in Japan.

The adults are very small, silvery-white with pale yellow markings, and a black spot at the tip of each forewing. Eggs are about 0.27 mm in length, flat, and without sculpturing or covering. The mature larva is cylindrical and dull yellow in color. The larval head is small. It has a pair of antennae terminating in two rounded lobes and rudimentary mouth parts with the exception of the spinnerets. The earlier larval stages are pale greenish-yellow and have modified mouthparts for sap feeding. The later larval stages are similar in form, though the head and thoracic segments of the earlier stages are proportionately larger. The pupa is pale-yellow inside the cocoon, and has a stout curved prong on its head and heavy spines on the abdomen which are used during emergence.

In Florida, J. B. Heppner has produced several reviews on this pest (see references below) and has other works in press. The original collection was at Homestead, Florida on May 20, 1993. This infestation involved 90 percent of a 200 acre Persian lime orchard. Many other collections have come from nurseries, orchards and dooryards in the greater Miami area. In Florida at least, there are several native rutaceous species that could serve as alternate hosts for the miner, and it may also be able to attack several of the native mistletoes that occur there. The literature indicates that the miner often spreads very rapidly through areas when it is newly introduced. Indications are that it is doing the same in Florida.

References:

Heppner, J.B., 1993: Citrus leafminer, *Phyllocnistis citrella* Stainton (Lepidoptera: Gracillariidae: Phyllocnistinae). Fla. Dept. Agric. & Cons. Serv. Entomol. Circ. #359. 2 pp.

Heppner, J.B., 1993: Citrus leafminer (CLM), *Phyllocnistis citrella* Stainton (Lepidoptera: Gracillariidae: Phyllocnistinae). Florida State Collection of Arthropods, DPI/FDACS Summary Report: Pest Alert. 4 pp.

(Note: both references are available through Dr. Heppner at the Florida Department of Agriculture and Consumer Services, Division of Plant Industry, P.O. B. 147100,Gainesville, FL32614-7100.)

Heppner, J.B., 1995: Citrus leafminer (Lepidoptera: Gracillariidae) on fruit in Florida. Florida Entomologist, 78(1): 183-186.

Hoy, M.A. and R. Nguyen, 1997: Classical biological control of the citrus leafminer *Phyllocnistis citrella* Stainton. Tropical Lepidoptera, 8(1):1-19.

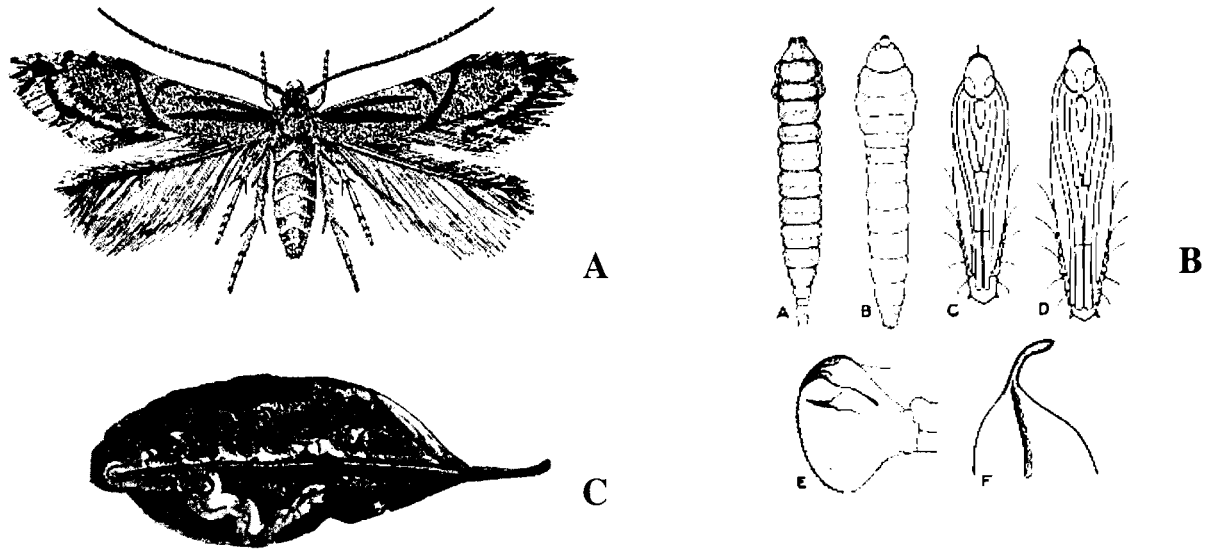

Fig 2 A. adult citrus leaf miner, *Phyllocnistis citrella*. B. immatures, showing (a) mature larva, (b) prepupa, (c) male pupa, (d) female pupa, (e) larval mandible, (f) pupal head prong. (c) characteristic mines in leaf.

DANCING MOTH, *Dryadaula terpsichorella*- This moth represents a new state record found for the first time in San Diego County in July of 1998 and February 1999.

The following information was obtained from "Pan-Pacific Entomologist", volume 75(4): 221-223. Dr. Jerry A. Powell (Essig Museum of Entomology, UC Berkeley), gives a first hand account of his collection and identification of *D. terpsichorella*, the dancing moth.

D. terpsichorella was first collected in Honolulu, Hawaii in 1901 and was presumed to have been introduced from Central America because several congeners occur there. *Dryadaula* is most strongly represented in Australia and New Zealand, which alternatively suggests the western Pacific as a possible source. Most likely colonization occurred at San Diego Bay, a major military and commercial shipping port.

Fig 3. Adult dancing moth.

The adults are small (3.4-3.9mm) but morphologically very distinctive from any other California moth. The forewing is slightly bowed, rounded distally, longitudinally streaked with dark grey-brown and pale rust, and with a delicate row of metallic spots at the end of the cell. The adults perform perculiar, circular "dances" around lighting. The larvae are found among dead leaves of various plants. These include banana, pineapple, and sugar cane. Although they are thought to be detrivores, the actual food is not known, and they may in fact be fungivores.

SIGNIFICANT FINDS IN OTHER STATES

Pecan weevil, *Curculio caryae*, has been found in New Mexico in portions of Dona Ana and Otera counties. Ten acres of Otera County and eight acres of Dona Ana County have been found to have the weevil. Detection surveys will be conducted by the New Mexico Department of Agriculture to determine the extent of these infestations and to check if any other infested orchards exist in the area.

The New Mexico Department of Agriculture will not authorize the shipment of untreated, in-the-shell pecans under Permit No. QC 571 (untreated shipments of in-the-shell pecans to California) to any shipper in the State of New Mexico that poses a threat of having a pecan weevil infestation.

All pecans and associated trash from the infested orchards will be isolated and treated by cold storage at -5°F for 168 hours. All harvest equipment associated with the infested orchards will be thoroughly cleaned and certified prior to movement. The New Mexico Department of Agriculture will notify CDFA if any other infested areas are found.

CDFA will issue an information advisory regarding the recent pecan weevil finds in New Mexico to all California county agricultural commissioners. Additionally, CDFA will add an appendix to our State Exterior Quarantine 3273 (Walnut and Pecan Pests) notifying inspectors of the recent pecan weevil detections in New Mexico. At this time, CDFA will not declare New Mexico as an area under quarantine for pecan weevil. However, private, uncertified shipments of in-the-shell pecans from New Mexico will continue to be denied entry into California.

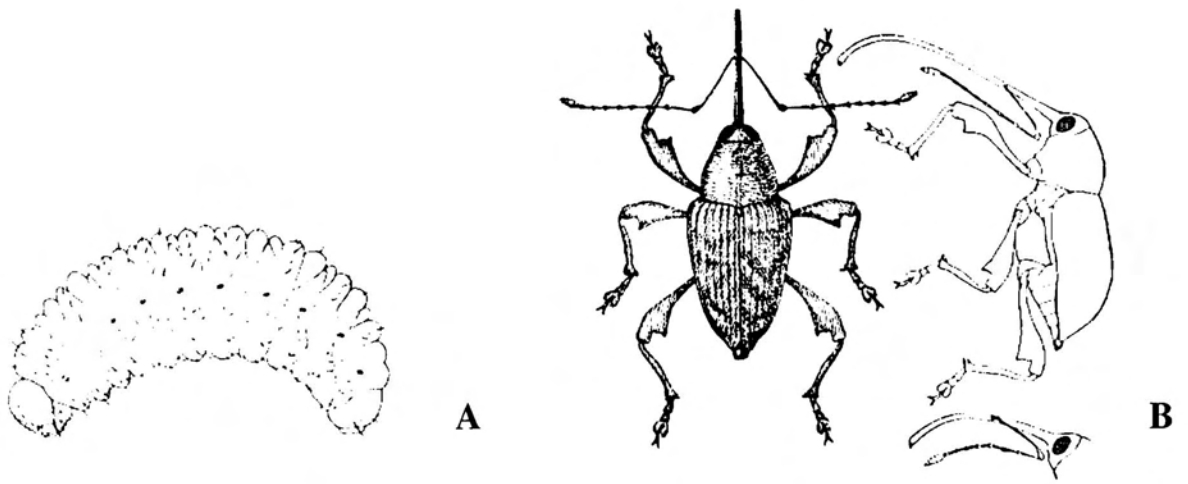

Fig.4 (A) *Curculio caryae* grub. (B) adult weevil.

SIGNIFICANT FINDS IN OTHER COUNTRIES

Olive fruit fly, *Bactrocera oleae,* has been found in large quantities in commercial olive orchards in Ensenada, Baja California, Mexico. The Mexican government is planning an eradication program.

EXCLUSION

Several pest species that are not established in the state are collected every year on incoming or newly arrived nursery stock or other similar quarantine situations. The following are examples of such rated pests. For additional information on significant quarantine and border station interceptions, see pages 84-87.

LARGE COTTONY SCALE, *Pulvinaria mammeae* -(Q)- Found in a nursery in Saticoy, **Ventura** County on May 26, 1999 by Gerry. The host was *Litchi chinensis.*

SLENDER SOFT SCALE, *Coccus acutissimus* -(Q)- Found by Henna at a nursery in Torrance, **Los Angeles** County on July 26, 1999. It was collected from Sago palm.

PLANT PATHOLOGY HIGHLIGHTS

Penn State College of Agricultural Sciences, Cooperative Extension, has published a useful brochure on Sharka, or plum pox virus, which is available by contacting the Publications Distribution Center, Pennsylvania State University, 112 Agricultural Administration Building, University Park, PA 16802. For information, call (814)865-6713. Photos and symptoms of PPV can also be found at the the following websites:

http://sharka.cas.psu.edu
http://www.state.pa.us/PA_Exec/Agriculture/plum_pox

See also CPPDR volume 18 (3-4): 73 for additional information.

Border Stations

Important "A", "B", and "Q" Rated Arthropods and Mollusks Intercepted through December 1999

Pest	Station	Date	Origin	Collector	Host
Citrus snow scale-*Unaspis citri*	TR	05/18/99		Kiser	*Citrus paradisi*
trilobe scale-*Pseudaonidia trilobitiformis*	VI	05/25/99	Mexico	Pastell	*Mangifera indica*
trilobe scale-*Pseudaonidia trilobitiformis*	*VI*	05/23/99	Mexico	Pastell	*Mangifera indica*
pale Tussock moth-*Halysidota tessellaris*	VI	05/24/99	Louisiana	Granger	trailer
an ant-*Camponotus abdominalis*	BL	05/02/99	Florida	Perez-Argueta	household goods
an ant-*Crematogaster* sp.	NE	05/23/99	Texas	Johnson	trailer bed
an ant-*Crematogaster* sp.	BL		Florida	Klingenmeier	*Cucurbita pepo*
Vanda orchid scale-*Genaparlatoria pseudaspidiotus*	VI	05/25/99	Mexico	Pastell	*Mangifera indica*
Oriental beetle-*Anomala orientalis*	NE	04/28/99	North Carolina	Kole	bed of truck
an armored scale-*Aulacaspis tubercularis*	VI	05/19/99	Mexico	Pastell	*Mangifera indica*
an armored scale-*Aulacaspis tubercularis*	VI	05/23/99	Mexico	Pastell	*Mangifera indica*
an armored scale-*Aulacaspis tubercularis*	BL	05/18/99	Guatemala	Klingenmeier	*Mangifera indica*
pecan weevil-*Curculio caryae*	NE	04/06/99	Louisiana	Johnson	*Carya illinoinensis*
Oriental scale-*Aonidiella orientalis*	NE	01/17/99	Kentucky	Martinez	*Cocos nucifera*
Oriental scale-*Aonidiella orientalis*	BL	04/19/99	Florida	Villa	plant
a scuttle fly-*Megaselia seticauda*	BL	04/13/99	Mexico	Klingenmeier	
Garden bagworm-*Apterona helix*	NE	03/27/99	Michigan	Derichsweiler	RV wheel rims
Eastern flower thrips-*Frankliniella tritici*	BL	04/09/99	Florida	Saldivar	houseplant
corn silk fly-*Euxesta stigmatias*	BL	04/18/99	Florida	Gamez	*Zea mays*
Pacific mealybug-*Planococcus minor*	AP	05/21/99		Sharma	*Nephelium lappaleum*
trilobe scale-*Pseudaonidia trilobitiformis*	AP	06/11/99	Florida	Wion	*Mangifera indica*
black thread scale-*Ischnaspis longirostris*	AP	06/01/99	Guam	Sharma	*Piper betel*
a mealybug-*Laminicoccus* sp.	AP	05/21/99		Sharma	*Garcinia mangostana*

Important "A", "B", and "Q" Rated Arthropods and Mollusks Intercepted in Quarantine through December 1999

Rating	Species	Common Name	Date	Origin	County	Host	Collector(s)
Q	*Echinothrips americanus*	a thrips	04/19/99	Michigan	SCL	*Hibiscus* sp.	Barerra
Q	*Xylosandrus compactus*	a bark beetle	05/07/99	Hawaii	RIV	cut foliage	Chandler
Q	*Rhizoecus hibisci*	a root mealybug	04/29/99	Hawaii	LAX	*Rhapis* sp.	Bakri
Q	*Rhizoecus hibisci*	a root mealybug	05/06/99	Hawaii	ALA	*Caryota* sp.	Fernandez
Q	*Ponera* sp.	an ant	05/07/99	Hawaii	RIV	*Protea* sp.	Lahti
Q	*Diploptera punctata*	pacific beetle cockroach	05/10/99	Hawaii	ORA	mixed cut floral	Barnes
Q	*Coccus acutissimus*	slender soft scale	05/05/99	Hawaii	LAX	*Litchi chinensis*	Calicchia
Q	*Coccus acutissimus*	slender soft scale	05/06/99	Hawaii	ORA	*Litchi chinensis*	Fernandez
Q	*Anoplolepis longipes*	longlegged ant	05/26/99	Hawaii	MEN	*Zingiber* sp.	Stephens
Q	*Pseudococcus lycopodii*	club moss mealybug	05/24/99	Hawaii	SDG	*Lycopodium* sp.	Worcester
Q	*Pinnaspis uniloba*	unilobed scale	05/07/99	Hawaii	SDG	*Alyxia olivaeformis*	Dobbins
Q	*Pinnaspis uniloba*	unilobed scale	05/07/99	Hawaii	SDG	*Alyxia olivaeformis*	Dobbins
Q	*Parlatoria ziziphi*	black citrus scale	05/03/99	Thailand	SDG	*Citrus* sp.	Olivares
Q	*Parlatoria ziziphi*	black citrus scale	02/11/99	Thailand	SDG	*Citrus* sp.	Dobbins
Q	*Parlatoria ziziphi*	black citrus scale	05/03/99	Thailand	SDG	*Citrus* sp.	Hinton
Q	*Parlatoria ziziphi*	black citrus scale	05/03/99	China/Thailand	SDG	*Citrus* sp.	Feeley
Q	*Neocicada hieroglyphica*	a cicada	05/05/99	Florida	SAC	tree fern	Hightower
A	*Ceroplastes rubens*	red wax scale	05/18/99	Florida	SDG	*Pouteria sapota*	Fritz
Q	*Neocicada hieroglyphica*	a cicada	05/03/99	Florida	SAC	tree fern	Hightower
B	*Diaphania nitidalis*	pickleworm	05/26/99	Florida	SMT	pickle	Bradbury
B	*Lamellaxis* sp.	a snail	05/26/99	Florida	SJQ	majesty palm	Lansigan
Q	*Orchamoplatus mammaeferus*	croton whitefly	05/12/99	Hawaii	SDG	*Alyxia olivaeformis*	Ginsky
Q	*Aleurocanthus woglumi*	citrus blackfly	05/18/99	Florida	SMT	*Citrus* sp.	Simon
B	*Diaphania nitidalis*	pickleworm	05/18/99	Florida	SMT	Tindora	Romo
Q	*Pseudococcus jackbeardsley*	a mealybug	05/25/99	Hawaii	SMT	orchid	Simon
B	*Diaphania nitidalis*	pickleworm	05/18/99	Florida	SMT	Tindora	Romo
Q	*Pinnaspis uniloba*	unilobed scale	05/12/99	Hawaii	SMT	*Alyxia olivaeformis*	Romaine
Q	*Pulvinaria mammeae*	large cottony scale	05/18/99		VEN	*Litchi chinensis*	Gribble
B	*Siphanta acuta*	torpedo bug	05/06/99	Hawaii	SJQ		Bryant
Q	*Sophonia rufofascia*	a leafhopper	05/24/99		SHA	*Citrus hystrix*	Moen
Q	*Empoasca* sp.	a leafhopper	05/20/99	Hawaii	SON		Bryant
B	*Ferrisia virgata*	striped mealybug	05/23/99	Florida	VEN	*Psidium guajava*	Wong
Q	*Greenidea formosana*	an aphid	05/19/99	Hawaii	SBA	cut foliage	Boise
Q	*Chrysodeixis chalcites*	green garden looper	05/27/99	Hawaii	SCL	cut flowers	Barrera
Q	*Coccus acutissimus*	slender soft scale	05/05/99	Hawaii	SBA	cut foliage	Rajala

Important "A", "B", and "Q" Rated Arthropods and Mollusks Intercepted in Quarantine through December 1999

Rating	Species	Common Name	Date	Origin	County	Host	Collector(s)
Q	*Crenidorsum* sp.	a whitefly	05/05/99	Hawaii	SMT	*Philodendron* sp.	Simon
B	*Diaphania nitidalis*	pickleworm	05/05/99	Florida	SMT	*Cucumis sativus*	Romo
B	*Diaphania nitidalis*	pickleworm	05/12/99	Florida	SMT	Tindora	Rodriguez
Q	*Aulacaspis tubercularis*	an armored scale	06/08/99	Puerto Rico	FRE	*Mangifera indica*	Vasquez
B	*Ferrisia virgata*	striped mealybug	06/07/99	Ecuador	FRE	*Alpinia purpurata*	Kahue
Q	*Scirtothrips dorsalis*	a thrips	06/24/99	New York	FRE	khat	Lebaron
Q	*Meghimatium striatum*	a slug	06/17/99	Hawaii	LAX	Mingerilia	Matsumoto
Q	*Rhytidoporus indentatus*	a negro bug	05/26/99	Hawaii	LAX	in soil of palms	Carrillo
Q	*Rachiplusia ou*	a plusiine looper	06/09/99		RIV	*Hedera* sp.	Lahti
Q	*Kilifia* sp.	a soft scale	06/19/99	Guatemala	SJQ	*Diffenbachia* sp.	Lansigan
A	*Thrips florum*	a flower thrips	06/15/99	Hawaii	ALA	Leis	Roache
A	*Thrips florum*	a flower thrips	06/19/99	Hawaii	ALA	*Gardenia* sp.	Roache
A	*Thrips florum*	a flower thrips	06/10/99	Hawaii	ALA	Leis	Roache
A	*Thrips florum*	a flower thrips	06/15/99	Hawaii	ALA	Leis	Roache
Q	*Stenchaetothrips* sp.	a thrips	06/23/99	Hawaii	ALA	Lei	Roache
Q	*Stenchaetothrips* sp.	a thrips	06/18/99	Hawaii	ALA	Leis	Roache
Q	*Stenchaetothrips* sp.	a thrips	06/12/99	Hawaii	ALA	Lei	Grazzini
A	*Rhizotrogus majalis*	European chafer	06/24/99	Indiana	ALA	aircraft	Freeman
A	*Rhizotrogus majalis*	European chafer	06/25/99		ALA	aircraft	Chang
Q	*Sitobion* sp.	an aphid	06/17/99	Hawaii	ALA	Orchid lei	Roache
Q	*Wasmannia auropunctata*	an ant	05/26/99	Florida	LAX	carrotwood	Sium
A	*Anastrepha suspensa*	Caribbean fruit fly	05/25/99	Florida	LAX	*Citrus paradisi*	Dias
Q	*Pseudococcus odermatti*	a mealybug	06/08/99	Florida	ORA	*Schefflera amate*	Fernandez
A	*Morganella longispina*	plumose scale	06/24/99	Florida	ORA	*Ficus benjamina*	Kinsella
A	*Morganella longispina*	plumose scale	06/24/99		ORA	*Ficus benjamina*	Kinsella
A	*Ostrinia nubilalis*	European corn borer	06/10/99	Maryland	MER	peas in the pod	Esau
Q	*Palmicultor* sp.	a mealybug	06/08/99	Florida	ORA	*Wodyetia bifurcata*	Fernandez
Q	*Hemiberlesia diffinis*	diffinis scale	06/24/99	Florida	ORA	*Ficus benjamina*	Kinsella
Q	*Pseudaulacaspis major*	lychee bark scale	06/23/99	Florida	ORA	*Litchi chinensis*	Wynn
Q	*Unaspis yanonensis*	arrowhead scale	05/24/99	Malaysia	SDG	*Citrus* sp.	Hinton
A	*Ceroplastes rubens*	red wax scale	06/01/99		SDG	*Mangifera indica*	Davy
A	*Coccus viridis*	green scale	06/24/99	Hawaii	SDG		Fritz
A	*Coccus viridis*	green scale	06/03/99		SDG		Terhall
B	*Dysmicoccus alazon*	alazon mealybug	06/09/99	Mexico	SFO	*Litchi chinensis*	Lino
Q	*Gyponana* sp.	a leafhopper	06/07/99	Florida	SAC	*Asparagus plumosus*	Saunders

Rating	Species	Common Name	Date	Origin	County	Host	Collector(s)
B	*Pseudococcus elisae*	Elisa mealybug	05/27/99	Puerto Rico	FRE	*Mangifera indica*	Vasquez
A	*Parlatoria proteus*	Sansevieria scale	06/24/99	Guatemala	SJQ	*Dracaena sanderana*	Curry
A	*Pinnaspis strachani*	lesser snow scale	06/16/99	Costa Rica	SJQ	*Dracaena marginata*	Viss
Q	*Sybra alternans*	a longhorned beetle	06/06/99	Hawaii	SMT	assorted herbs	Ventura
Q	*Gyponana* sp.	a leafhopper	06/23/99	Hawaii	SMT	pepper leaf	Reyes
Q	*Odontomachus* sp.	an ant	06/22/99	Florida	SMT	*Schefflera arboricola*	Toruno
A	*Anastrepha suspensa*	Caribbean fruit fly	06/23/99	Dom. Republic	SMT	*Manilkara zapota*	Reyes
Q	*Homalodisca* sp.	a leafhopper	05/27/99	Costa Rica	SMT	*Zingiber* sp.	Davis
B	*Subulina* sp.	a snail	06/22/99	Hawaii	SON	*Dracaena warneckii*	Vernon
Q	*Pseudococcus jackbeardsley*	a mealybug	06/14/99	Florida	SCL	*Artocarpus heterophyllus*	Beauregard
A	*Furcaspis biformis*	red orchid scale	05/29/99	Hawaii	SON	orchid	Bryant
A	*Ceroplastes rusci*	fig wax scale	06/28/99	Florida	SCL	*Ficus benjamina*	
Q	*Aleurocerus palmae*	palm whitefly	06/03/99	Florida	SHA	palm	Matson
Q	*Dichromothrips corbetti*	a thrips	10/01/99	Hawaii	ALA	*Orchid leis*	Roache
Q	*Proxys punctulatus*	a stinkbug	06/30/99		ALA	aircraft	Lun
Q	*Scirtothrips cardamomi*	cardamom thrips	07/22/99	Hawaii	ALA	*Curcosma olena*	Roache
Q	*Vryburgia trionymoides*	asclepias mealybug	07/08/99	Japan	SDG	*Lithops* sp.	Fritz
A	*Spodoptera latifascia*	an armyworm	07/01/99	Florida	ORA	*Ficus benjamina*	Kinsella
Q	*Pterophylla camellifolia*	true katydid	07/12/99	Florida	SAC	*Asparagus plumosus*	Bianchi
Q	*Scirtothrips cardamomi*	cardamon thrips	07/06/99	Hawaii	RIV	*Zingiber* sp.	Lahti
Q	*Oligonychus* sp.	a spider mite	07/06/99	Hawaii	RIV	tropical foliage	Lahti
Q	*Callirhopalus bifasciatus*	twobanded Japanese weevil	07/20/99		RIV	various ornamentals	Domenigoni
Q	*Aleurocerus palmae*	palm whitefly	07/09/99	Thailand	RIV	palm	Chandler
B	*Pseudococcus elisae*	Elisa mealybug	07/28/99	Florida	SFO	*Aglaonema* sp.	Gilroy

BOTANY HIGHLIGHTS

In the month of January 2000, specimen submissions to the Plant Pest Diagnostics Center Botany Laboratory Herbarium (CDA) revealed a previously overlooked perennial species of *Cotula* (often called brass buttons). It was found infesting turf, specifically close-cut turf on golf course greens. Although not hitherto reported in North America as an adventive, this taxon, currently unidentified to specific rank, is probably not a recent introduction. More likely it has been long-unrecognized due to its vegetative similarity to several other common turf weeds, (see table on page 89), all of which are found in golf greens as well as less close-cut turf. Although current information as to the frequency of this unknown taxon in turf throughout the state is absent, its low, creeping growth habit and lack of above-ground stems suggest that it may not be able to compete except in conditions where the grass turf is cut below about one (1) inch, or where the turf is not vigorous.

After it was first recognized from a golf course green in Sacramento County, searches in the same county found it present on at least three more courses. No specimens from any other counties have been received.

This article discusses how to distinguish this taxon from similar appearing turf weeds, why it is currently unidentified, and to bring its presence to the attention of golf course superintendents throughout the state. Unlike several similar appearing plants that infest golf course greens, this plant is a mat-forming perennial. While its interactions with the several species and cultivars of turf used in golf greens have not been evaluated, it is clear that at the least, under the conditions and turf types used for golf course greens in the Central Valley of California, it can make a green unplayable--ultimately requiring expensive repairs.

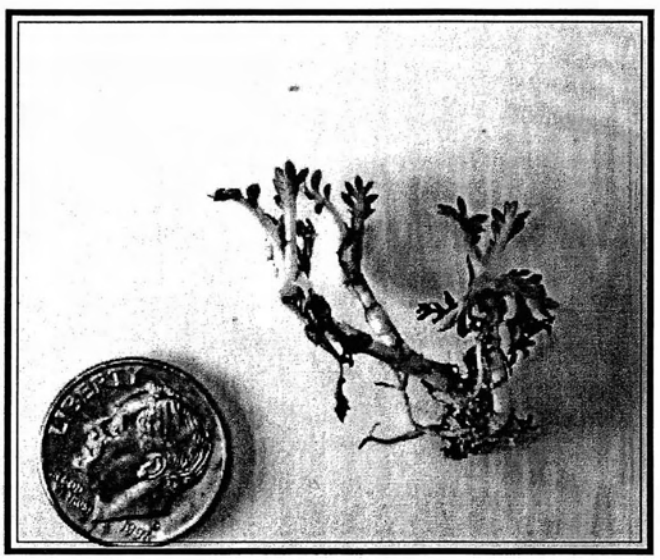

Fig 5. "unknown" *Cotula* sp.
Photo courtesy of Sacramento County Dept. of Agriculture

This new weed and the three similar appearing species often found in golf course greens are compared in the table on page 89. Although this is the only perennial taxon among these, under irrigated conditions in mild winter regions all can be found growing, flowering and fruiting year-round.

Character	"unknown" *Cotula* sp.	*Cotula australis*	*Soliva sessilis*	*Coronopus didymus*
FAMILY	Asteraceae	Asteraceae	Asteraceae	Brassicaceae
DURATION	perennial	annual	annual	annual
GROWTH FORM	rhizomatous	tap-rooted	tap-rooted	above ground
STEM LOCATION	below ground	above ground	above ground	above ground
LEAF TEXTURE	fleshy	not fleshy	not fleshy	not fleshy
LEAF VESTITURE	subglabrous-glabrous	strigose	strigose	thinly strigose
INFLORESCENCE FORM	capitulum	capitulum	capitulum	raceme
INFLORESCENCE POSITION	axillary	axillary	axillary	axillary/terminal
SCAPE	shorter or = leaf height	taller than leaf height	absent	shorter to longer than leaves
FRUIT FORM	plano-convex	plano-convex	plane or slightly plano-convex	globose
FRUIT VESTITURE	glabrous	body papillate, marginal wings glabrous	hispid to almost glabrous	glabrous
FRUIT SPINES	absent	absent	present on summit	absent
FRUIT SHAPE	elliptic	elliptic	obovate	roundish
FRUIT WINGS	absent to narrow	narrow	broad	absent
FRUIT ATTACHMENT	marginal short stalked, disk flrs sessile	marginal well-stalked, disk flrs sessile	all sessile	pedicellate
FLOWER TYPE(S)	disk perfect, sterile, marginal pistillate, fertile	disk perfect, sterile, marginal pistillate, fertile	disk perfect, sterile, marginal pistillate, fertile	all perfect

As seedlings, *Cotula australis*, *Soliva sessilis* and *Coronopus didymus* may display a single rosette with deeply divided leaves similar to the "unknown" *Cotula* sp. They can be readily distinguished from the latter by uprooting a rosette and observing the root system. The three former taxa have a fine, near vertical taproot with numerous shallow, dusky colored capillary-like secondary roots, and the plant can be removed easily; the latter has a thick, horizontal underground stem (see Fig. 5 on previous page) with sparsely branched stout white roots that penetrate deeply, generally reaching well below the roots of the turf, and the plant must be pulled strongly to remove root and stem material from below the ground.

Observation of the characteristics provided in the table above may require magnification for clear and unambiguous classification. Flower parts of *Cotula* and *Soliva* are particularly diminutive and require up to 30x magnfication for clear viewing. It is not an accident that the genera *Cotula* and *Soliva* have similar characteristics, both are related members of the tribe Anthemideae (mayweeds, chrysanthemums) in the Asteraceae (daisy or sunflower family). The vegetative similarity of *Coronopus* in the Brassicaceae or mustard family is convergent; these plants are not close relatives to the sunflowers.

The mode of introduction of this taxon to California is unknown. However, it has small seeds (gen. <1mm in length) and fruits at the low height of golf course greens. Thus it may easily be spread via mud-encrusted golf spikes and as such could have been brought into California from the southern Hemisphere on golf shoes. In addition, several related species are grown

as ornamentals. None are common or general landscape plants, but are used occasionally for (very) small-scale ground covers and are sold for such purpose by specialty nurseries. Thus the plant could be another on an increasingly lengthy list of ornamental species escaping and becoming weedy in California.

Cotula is a genus of 60 - 80 species distributed natively on all Southern Hemisphere continents except Antarctica. The majority are perennial. Of the two most common weedy species one is annual (*Cotula australis*, Australian brass buttons) and one perennial (*Cotula coronipifolia*, South African brass buttons). Both are naturalized world-wide, including California. The latter was originally introduced as an ornamental, the former probably a seed contaminant.

Unfortunately no world-wide monograph of *Cotula* has ever been published. Moreover, the plants are diminutive and easily overlooked; collections are scarce even in herbaria within their native regions. Thus, matching this taxon to an authentic specimen may not be readily possible given the general similarity among all the perennial taxa and the lack of detailed literature. All consulted floristic resources compiled in the genus' native regions have commented upon the need for a current monographic revision.

Description of "unknown" *Cotula* sp.

Perennial, rhizomatous, forming a dense mat with terminal rosettes at the soil surface. Lvs. evergreen, alternate, pinnate, the divisions shallowly toothed at their summit or, in wild material secondary teeth often absent. Leaf bases slightly expanded, somewhat sheathing, exstipulate. Lvs. gen. glabrous, ± fleshy. Scape axillary, unbranched, thinly strigose. Capitula terminal, gen. shorter than the leaves. Phyllaries 7-8 in number, herbaceous, scarious-margined, overlapping. Flowers discoid, the marginal pistillate, gen. of the same number as the phyllaries, gen. fertile (forming fruits), overlapping, short-stalked, the stalk stout; central flowers sessile, perfect, sterile (functionally staminate), white to almost colorless, 4-5 in number. Disk corolla apparently 3-lobed, but vigorous, warm-season material not yet observed (the genus is normally 4-lobed). Fruits plano-convex, glabrous, narrowly winged to unwinged. Flowering in Southern Hemisphere *Cotula* is generally from September to February, centering on December to January.

Cotula sensu lato is sometimes split into at least three subgenera: *Cotula* sensu stricto (ie. subgenus *Cotula*), including *C. coronopifolia*; subgenus *Strongylosperma*, including *C. australis*; and subgenus *Leptinella*, which, as treated by H.H. Allan in Flora of New Zealand V. I (native taxa) 1961& Webb et al., V. IV (non-native taxa) 1988, would probably include this "unknown" taxon. However, it does not unequivocally represent any of the 28 taxa treated or discussed therein. Of the 24 native taxa, 21 are endemic to New Zealand, and the 4 non-native taxa include *C. coronopifolia* and *C. australis*. Subgenus *Leptinella* is distributed from New Zealand, Tasmania, Kerguelen, Marion and Crozet Island and Fuegia, as per Allan op. cit. although the total number of species accounted for was not reported.

Due to the diminutive size of the plant and the lack of flowering or fruiting structures on plants collected in mid-winter (January here in the Northern Hemisphere), we are currently growing in the greenhouse specimens from the four known sites. This is being done in order to acquire adequate flowering and fruiting material so that specimens may be sent to Australia and New Zealand botanists for study.